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Dy-Ga (Dysprosium-Gallium)

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The Dy-Ga phase diagram in [Massalski2] was redrawn from [Moffatt]. The existence of seven intermediate phases (Dy_5Ga_3, DyGa, $DyGa_2$, γ$DyGa_3$, β$DyGa_3$, α$DyGa_3$, $DyGa_6$) was reported.

Figure 1 shows the Dy-Ga phase diagram determined by [2006Ao] by means of differential scanning calorimetry and X-ray diffraction analysis. A new phase N was found to exist between 1295 and 1217 °C and between DyGa and $DyGa_2$, but its exact composition is unknown. No polymorphic transformation was found in the $DyGa_3$ phase. The stable phase is Mg_3In type (α$DyGa_3$ in [Massalski2]).

This new phase diagram may need further refinement because the $DyGa_2$ liquidus is too asymmetric around the congruent melting point.

Phase boundaries of this phase diagram below 10 at.% Ga was adopted from [Massalski2]. The shape of the (αDy) phase must be reinvestigated because the left and right boundaries of the L + (αDy) two-phase field would cross one another when smoothly extrapolated to higher temperatures.

Table 1 shows Dy-Ga crystal structure data. [Pearson 3] shows crystal structure data for Dy_3Ga_2 and Dy_3Ga_5 in addition to the phases shown in Fig. 1. Stability of these compounds must be examined.

Table 1 Dy-Ga crystal structure data

Phase	Composition, at.% Ga	Pearson symbol	Space group	Strukturbericht designation	Prototype
(βDy)	0 to ?	*cI*2	$Im\bar{3}m$	*A*2	W
(αDy)	0 to ?	*hP*2	$P6_3/mmc$	*A*3	Mg
Dy_5Ga_3	37.5	*tI*32	I4/*mcm*	$D8_l$	Cr_5B_3
Dy_3Ga_2(a)	40	*tI*80	I4/*mcm*	...	Ga_2Gd_3
DyGa	50	*oC*8	*Cmcm*	B_f	CrB
N	?	...	...	...	...
Dy_3Ga_5 (a)	62.5	*oP*32	*Pnma*	...	Ga_5Tm_3
$DyGa_2$	66.7	*hP*3	P6/*mmm*	*C*32	AlB_2
$DyGa_3$	75	*hR*16	$R\bar{3}m$	...	...
$DyGa_6$	85.7	*tP*14	*P*4/*nbm*	...	...
(Ga)	100	*oC*8	*Cmca*	*A*11	Ga

(a) Not shown in Fig. 1

References

2006Ao: W.Q. Ao, J.Q. Li, Y.X. Jian, F.S. Liu, and Y.H. Zhuang, Reinvestigation of the Phase Diagram of the Dy-Ga Binary System. *Proceedings of China-Japan Joint Symposium on Phase Diagrams, Materials Design and Their Applications*, Xiamen, China, 2006, p 253-257

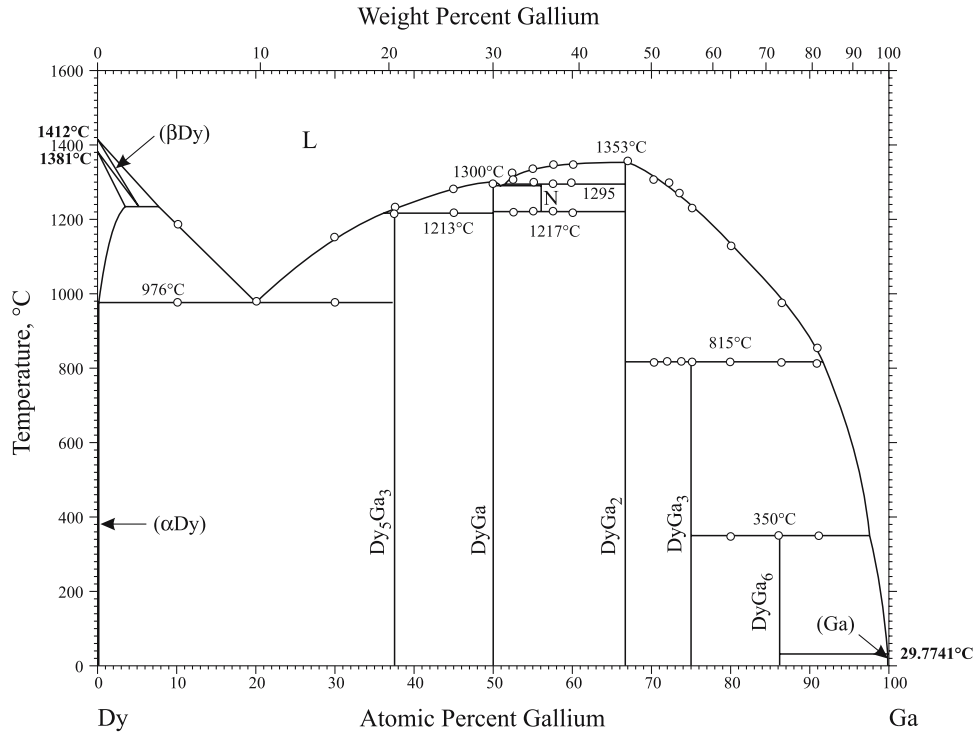

Fig. 1 Dy-Ga phase diagram